

List of the Claims:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

The claims have not been amended. The following list of claims, rather, is presented for the convenience of the reader.

1. (original) An exposure apparatus that exposes a substrate by irradiating the substrate with exposure light through a projection optical system and a liquid, comprising:
 - a liquid supply mechanism that supplies the liquid between an image plane side tip part of the projection optical system and an object that opposes the tip part;
 - a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started; and
 - a control apparatus that determines, based on a measurement result of the timer, whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid.
2. (original) An exposure apparatus according to claim 1, wherein the control apparatus determines, based on the measurement result of the timer, that the space is filled with the liquid when the time that has elapsed since the supply of the liquid was started reaches a prescribed time.
3. (previously presented) An exposure apparatus according to claim 1, wherein the liquid supply mechanism comprises a support port, which supplies the liquid, and a valve, which opens and closes a passage that is connected to the supply port; and the timer starts the measurement of time when the valve has opened the passage.
4. (original) An exposure apparatus according to claim 1, comprising:
 - a detector that detects a gas portion in the liquid;

wherein,

after the control apparatus determines that the space is filled with the liquid, it detects a gas portion in the liquid that filled the space.

5. (original) An exposure apparatus according to claim 1, wherein

after the control apparatus determines that the space is filled with the liquid, it irradiates the exposure light.

6. (original) An exposure apparatus that exposes a substrate by irradiating the substrate with exposure light through a projection optical system and a liquid, comprising:

a liquid supply mechanism that supplies the liquid between an image plane side tip part of the projection optical system and an object that opposes the tip part;

a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was stopped;

a liquid recovery mechanism that recovers the liquid while the liquid is being supplied by the liquid supply mechanism, as well as after such supply has stopped; and

a control apparatus that determines, based on a measurement result of the timer, whether the liquid has been recovered from the space between the image plane side tip part of the projection optical system and the object.

7. (original) An exposure apparatus according to claim 6, wherein

the control apparatus determines, based on the measurement result of the timer, that the liquid has been recovered from the space when the time that has elapsed since the supply of the liquid was stopped reaches a prescribed time.

8. (previously presented) An exposure apparatus according to claim 6, wherein the liquid supply mechanism comprises a supply port, which supplies the liquid, and a valve, which opens and closes a passage that is connected to the supply port; and the timer starts the measurement of time when the valve has closed the passage.

9. (previously presented) An exposure apparatus that exposes a substrate by irradiating the substrate with exposure light through a projection optical system and a liquid, comprising:

a liquid supply mechanism that supplies the liquid between an image plane side tip part of the projection optical system and an object that opposes the tip part;

a liquid recovery mechanism that recovers the liquid;

a first measuring instrument that measures the amount of liquid supplied by the liquid supply mechanism;

a second measuring instrument that measures the amount of liquid recovered by the liquid recovery mechanism; and

a control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid.

10. (original) An exposure apparatus according to claim 9, wherein the control apparatus determines that the space is filled with the liquid when the difference between the measurement result of the first measuring instrument and the measurement result of the second measuring instrument falls below a prescribed value.

11. (previously presented) An exposure apparatus according to claim 9, wherein the control apparatus determines, based on the difference between the measurement result of the first measuring instrument and the measurement result of the second measuring instrument, whether an abnormality has occurred.

12. (original) An exposure apparatus according to claim 9, wherein after the control apparatus determines that the space is filled with the liquid, it irradiates the exposure light.

13. (previously presented) An exposure apparatus that exposes a substrate by irradiating the substrate with exposure light through a projection optical system and a liquid, comprising:

a liquid supply mechanism that supplies the liquid to a space between an image plane side tip part of the projection optical system and an object that opposes the tip part;

a liquid recovery mechanism that recovers the liquid;

a measuring instrument that measures the amount of liquid recovered by the liquid

Application Serial No. 10/589,437
Response filed May 24, 2010
Reply to Office Action mailed November 24, 2009

recovery mechanism since the supply of the liquid by the liquid supply mechanism was stopped; and

a control apparatus that determines, based on the measurement result of the measuring instrument, whether the liquid has been recovered from the space.

14. (original) An exposure apparatus according to claim 13, wherein the liquid is recovered while moving a recovery port of the liquid recovery mechanism and the object relative to one another.

15. (previously presented) An exposure apparatus according to claim 13, wherein the object includes the substrate or a movable substrate stage that holds the substrate; and

the liquid is filled between the projection optical system and the substrate or a prescribed region on the substrate stage.

16. (original) A supplying method that supplies a liquid to a space between an image plane side tip part of a projection optical system and an object that opposes the tip part, comprising the steps of:

supplying the liquid to the space;
measuring the time that has elapsed since the start of the supply; and
determining that the space is filled with the liquid at a point in time when the elapsed time exceeds a prescribed time.

17. (previously presented) A supplying method that supplies a liquid to a space between an image plane side tip part of a projection optical system and an object that opposes the tip part, comprising the steps of:

simultaneously supplying and recovering the liquid to and from the space;
measuring an amount of liquid supplied and an amount of liquid recovered per unit of time; and
determining that the space is filled with the liquid at least one of the point in time when the difference between the amount supplied and the amount recovered has become less than a prescribed value, or the point in time when a prescribed time has elapsed since the difference between the amount supplied and the amount recovered became less than the prescribed value.

18. (previously presented) A supplying method according to claim 16, comprising the step of:

exposing a substrate by irradiating the substrate with exposure light through a projection optical system and the liquid after determining that the space is filled with the liquid.

19. (original) A recovering method that recovers a liquid that is filled in a space between an image plane side tip part of a projection optical system and an object that opposes the tip part, comprising the steps of:

simultaneously supplying and recovering the liquid to and from the space;

stopping the supply of the liquid;

measuring the time that has elapsed since the stopping; and

determining that the recovery of the liquid that filled the space is complete at the point in time when the elapsed time exceeds a prescribed time.

20. (previously presented) A recovering method that recovers a liquid that fills a space between an image plane side tip part of a projection optical system and an object that opposes the tip part, comprising the steps of:

simultaneously supplying and recovering the liquid to and from the space;

measuring an amount of liquid supplied and an amount of liquid recovered per unit of time;

stopping the supply of the liquid; and

determining that the recovery of the liquid that fills the space is complete at least one of the point in time when the amount recovered has become less than a prescribed amount, or the point in time when a prescribed time has elapsed since the amount recovered became less than a prescribed value.

21. (previously presented) A recovering method according to claim 19, comprising the steps of:

exposing a substrate by irradiating the substrate with exposure light through the projection optical system and the liquid prior to stopping the supply of the liquid; and

unloading the substrate after it is determined that the recovery of the liquid that filled the space is complete.

22. (previously presented) An exposing method that supplies a liquid to a space, which is between an image plane side tip part of a projection optical system and an object that opposes the tip part, and exposes the object through the liquid, comprising the steps of:

supplying the liquid using the supplying method according to claim 16.

23. (previously presented) An exposing method that supplies a liquid to a space, which is between an image plane side tip part of a projection optical system and an object that opposes the tip part, and exposes the object through the liquid, comprising the step of:

recovering the liquid using the recovering method according to claim 19 .

24. (previously presented) A device fabricating method, comprising the step of: using an exposure apparatus according to claim 1.

25. (previously presented) An exposure apparatus according to claim 1, comprising: a liquid recovery mechanism that recovers the liquid while the liquid is being supplied by the liquid supply mechanism; wherein

the control apparatus determines whether the space is filled with the liquid based upon the measurement result of the timer and information from the liquid recovery mechanism.

26. (previously presented) An exposure apparatus according to claim 25, wherein the measurement result of the timer is an elapsed time since the supply of the liquid was started.

27. (previously presented) An exposure apparatus according to claim 26, wherein the information from the liquid recovery mechanism is an amount of liquid recovered by the liquid recovery mechanism per unit of time.

28. (previously presented) An exposure apparatus according to claim 1, comprising: a liquid recovery mechanism that recovers the liquid while the liquid is being supplied by the liquid supply mechanism; wherein

the control apparatus raises an alert when an amount of liquid recovered by the liquid recovery mechanism does not reach a predetermined value after a lapse of a prescribed time measured by the timer, the prescribed time being the elapsed time since the supply of the liquid

Application Serial No. 10/589,437
Response filed May 24, 2010
Reply to Office Action mailed November 24, 2009

was started.

29. (previously presented) An exposure apparatus according to claim 13, wherein the control apparatus raises an alert when an amount of liquid recovered by the liquid recovery mechanism does not fall below a predetermined value after a lapse of a prescribed time measured by the timer, the prescribed time being the elapsed time since the supply of the liquid was stopped.